AL.3.2008-204 c.2 v.3

University of Alberta Library
0 1620 3502964 2

Science 4

Light and Shadows

Home Instructor's Guide and Assignment Booklet 3B

3 · Module 3 · Science 4 · Module 3 · Science 4 · Module 3 · Science 4 ·

Alberta EDUCATION

Learning Technologies Branch

Science 4
Module 3: Light and Shadows
Home Instructor's Guide and Assignment Booklet 3B
Learning Technologies Branch
ISBN 0-7741-2867-4

Cover Art: Art Parts/Ron and Joe, Inc (www.ronandjoe.com). Used by permission.

The Learning Technologies Branch acknowledges with appreciation the Alberta Distance Learning Centre and Pembina Hills Regional Division No. 7 for their review of this Home Instructor's Guide and Assignment Booklet.

This document is intended for	
Students	✓
Teachers	✓
Administrators	
Home Instructors	✓
General Public	
Other	

You may find the following Internet sites useful:

- Alberta Education, **http://www.education.gov.ab.ca**
- Learning Technologies Branch, **http://www.education.gov.ab.ca/ltb**
- Learning Resources Centre, **http://www.lrc.education.gov.ab.ca**

Exploring the electronic information superhighway can be educational and entertaining. However, be aware that these computer networks are not censored. Students may unintentionally or purposely find articles on the Internet that may be offensive or inappropriate. As well, the sources of information are not always cited and the content may not be accurate. Therefore, students may wish to confirm facts with a second source.

Copyright © 2006, Alberta Education. This resource is owned by the Crown in Right of Alberta, as represented by the Minister of Education, Alberta Education, 10155 – 102 Street, Edmonton, Alberta, Canada T5J 4L5. All rights reserved.

No part of this courseware may be reproduced in any form, including photocopying (unless otherwise indicated), without the written permission of Alberta Education. This courseware was developed by or for Alberta Education. Third-party content has been identified by a © symbol and/or a credit to the source. Every effort has been made to acknowledge the original source and to comply with Canadian copyright law. If cases are identified where this effort has been unsuccessful, please notify Alberta Education so corrective action can be taken.

THIS COURSEWARE IS NOT SUBJECT TO THE TERMS OF A LICENCE FROM A COLLECTIVE OR LICENSING BODY, SUCH AS ACCESS COPYRIGHT.

UNIVERSITY LIBRARY
UNIVERSITY OF ALBERTA

Table of Contents

Module 3: Light and Shadows 4

Notes to the Home Instructor 4

Section 3: Twisting, Bouncing, and Breaking Up 5

Overview 5

Assessment and Feedback 5

Websites Mentioned in Module 3: Section 3 5

Additional Required Materials 6

Lesson Summaries

Lesson 9: Changing Directions 9

Lesson 10: Objects That Reflect 9

Lesson 11: Reflecting Technologies 10

Lesson 12: Bending Light 11

Lesson 13: Lenses 12

Lesson 14: White Light 13

Lesson 15: Making Colours 14

Module 3: Light and Shadows

Notes to the Home Instructor

This booklet contains the following components for you and your student:

1. Home Instructor's Guide

These are notes for you. First, there is an overview, a listing of suggested websites, and a listing of additional required materials needed for the section. Then, there is an overview of the content, activities, learning outcomes, and special requirements of each lesson in the section.

Note: To ensure that you have all of the materials on hand for your student to complete the activities for each module, read through the list of materials required for the lessons. They are boxed for easy reference, as shown in the following example.

Activity 1: Crackling Mints

- a mirror
- a very dark room
- 2 Wint-O-Green Lifesaver™ candies

2. Assignment Record Form

This is a form to send in with the assignments. Remember to paste the address label provided by your school on it. The teacher will keep track of your student's assignments, record your student's grades, and include his or her comments using this form.

3. Assignment

Your student should answer all questions in complete sentences where possible. Questions set up as lists, tables, charts, or graphs do not need sentence answers. Send the assignment to the teacher as soon as the booklet has been completed.

4. Home Instructor Feedback Form and Student Feedback Form

You and your student should complete these forms. Send them in at the same time as the assignment. They provide us with helpful information about what we are doing right and what needs to be changed.

5. Checklist

The checklist helps you confirm that all of the required components have been collected prior to submitting the completed work to the teacher. For students completing this module electronically, this checklist also includes spaces to indicate the method of submitting graphs, drawings, or photos of assignment work where required.

Section 3: Twisting, Bouncing, and Breaking Up

Overview

Light behaves in very specific ways. In this section, your student will look at how light travels and what different objects can do to alter its path.

Objects can interfere with light's path. If an object stops light completely, the object is opaque. An opaque object will cast shadows, and it will reflect or absorb all of the light hitting it. An excellent example of an opaque object is a mirror—almost all of the light is reflected, allowing you to see an image clearly. If an object allows much of the light to pass through it, the object is transparent. A transparent object will not cast a shadow, and it may cause the light to bend. Some objects cause light to bend more than others. An excellent example of light being bent is when light travels through an eyeglass lens—the light bends so that the eye can focus images better.

Technologies that use bending and reflecting light include telescopes, periscopes, kaleidoscopes, headlights, curved mirrors, fibre optics, cameras, and bicycle reflectors. The features A Closer Look and A Great Scientist highlight these inventions and more.

Assessment and Feedback

The feedback you and your student provide in the feedback forms will assist the teacher in assessing your student's progress.

The Section 3 Assignment is worth 82 marks out of the total 179 marks for this module.

Websites Mentioned in Module 3: Section 3

It is recommended that you check these websites prior to your student beginning work on this section.

Lesson 10: Objects That Reflect

- bicycle reflectors
  http://www.ph.bikexprt.com/bicycle/reflectors/reflwrk.htm

- reflective tape
  http://www.cyberglow.co.uk/reflective.htm

Lesson 14: White Light

- light and prism activity
  http://webphysics.ph.msstate.edu/javamirror/explrsci/dswmedia/prism.htm

Lesson 15: Making Colours

- mixing different colours of paint
  - **http://webphysics.ph.msstate.edu/javamirror/explrsci/dswmedia/colorsub.htm**
  - **http://www.ontariosciencecentre.ca/scizone/games/subtracting/default.asp**

- adding different colours of light together
  - **http://webphysics.ph.msstate.edu/javamirror/explrsci/dswmedia/coloradd.htm**
  - **http://www.ontariosciencecentre.ca/scizone/games/adding/default.asp**

Additional Required Materials

Activity 9A: Reflection

- a flashlight
- a small mirror
- a dark room

Activity 9B: Refraction

- a piece of paper with small printing on it, such as a newspaper
- a piece of clear plastic wrap
- water

Activity 10: Reflectors

- a flat, smooth piece of aluminum foil
- a sheet of white paper
- a metal spoon
- a piece of wood
- a towel
- a quarter
- a plastic toy
- at least 4 other objects of your choice
- a flashlight
- a dark room

Activity 11: Making a Kaleidoscope

- 3 small, flat unframed mirrors (8 cm × 10 cm or so)
- tape (Duct tape works best.)
- a crayon or a marble
- a ruler

Activity 12: Changing the Direction of Light

- a clear drinking glass
- a penny
- water
- about 50 mL vinegar
- about 50 mL cooking oil
- a helper
- a measuring tape or metre-stick

Activity 13: Lens Maker

- a clear, round, straight-sided drinking glass
- water
- a piece of cardboard (about 6 cm × 6 cm)
- a thick marker (felt pen)
- a ruler
- an object you can use to prop the cardboard

Activity 14: Bubble Rainbows

- 40 mL liquid dish detergent (Dawn™ works best.)
- 5 mL glycerine (optional; available at pharmacies, toiletries departments)
- 1 L water
- a metal coat hanger
- yarn (optional)
- a tray large enough to hold your bubblemaker
- measuring spoons
- a measuring cup
- a spoon for mixing

Activity 15: Colour Mixing

- red, green, yellow, and blue paint (tempera paints, water colours, finger paints, or vegetable food colouring)
- red, green, yellow, and blue cellophane (Coloured tissue paper brushed with cooking oil and allowed to dry will also work.)
- 4 flashlights
- scissors
- 2 sheets of white paper
- tape
- a room that can be darkened
- a paintbrush or eyedropper

Optional Follow-up Activities

Activity 1: Magnificent Magnifiers

- a magnifying glass
- white paper
- a light source (the Sun or an incandescent lamp)

Activity 2: Up Periscope!

- 2 empty, rinsed 1-L paper milk cartons
- 2 small flat mirrors
- a utility knife or scissors
- a ruler
- a pen or pencil
- tape (preferably, duct tape)

Activity 3: King-Sized Kaleidoscope

- 6 mirror tiles (30 cm × 30 cm)
- gloves (optional, for handling the tiles)
- duct tape
- a ruler
- a piece of strong cardboard (180 cm × 35 cm)
- scissors

Activity 4: What Colour?

- the 4 "coloured" flashlights you made in Activity 15
- coloured objects from around your home
- a completely dark room

Activity 5: Colour Wheel

- a small spinning top or a sharpened pencil
- lightweight white cardboard
- red, blue, and green markers
- a round object to trace (for example, a jar lid about 5 cm in diameter)
- a pencil
- tape
- a ruler
- a piece of black construction paper

Lesson Summaries

Lesson 9: Changing Directions

Summary

In the previous lesson, your student was introduced to the fact that the direction light travels can be changed by objects around it. In this lesson, your student will be introduced to the ideas that opaque objects absorb or reflect light, while transparent objects refract light. Refraction is simply the bending of light. Your student would benefit from searching in his or her home for transparent objects that bend light. Clues to identifying refraction include seeing objects as larger, smaller, or crooked when viewed through a transparent object.

Learning Outcomes

It is expected that your student will be able to

- describe modern technologies, such as a camera, that did not exist in the past;
- demonstrate how a variety of media can change the direction of light;
- recognize that light can be reflected;
- recognize that light can be bent (refracted);
- describe how a camera uses reflection and refraction.

Additional Required Materials

Activity 9A: Reflection

- a flashlight
- a small mirror
- a dark room

Activity 9B: Refraction

- a piece of paper with small printing on it, such as a newspaper
- a piece of clear plastic wrap
- water

Lesson 10: Objects That Reflect

Summary

In this lesson, your student will review the idea that light travels in straight lines. Your student will be asked to think about how he or she can see light from a source that is blocked from his or her view. You can reinforce this idea by asking your student to identify which objects the light beams would reflect off when he or she stands with a light source out of view. Your student should be able to find a pathway to show that the light is bouncing off objects in straight lines and into his or her eyes. The idea of light changing direction, introduced in this lesson, will be expanded over the next lessons.

Learning Outcomes

It is expected that your student will be able to

- follow a given set of procedures to find out if light travels around corners;
- draw a conclusion about how light travels;
- demonstrate that light travels outward from a source and continues unless blocked by an opaque material.

Additional Required Materials

Activity 10: Reflectors

- a flat, smooth piece of aluminum foil
- a sheet of white paper
- a metal spoon
- a piece of wood
- a towel
- a quarter
- a plastic toy
- at least 4 other objects of your choice
- a flashlight
- a dark room

Lesson 11: Reflecting Technologies

Summary

Mirrors and other reflectors are used to create devices that allow people to see the world and universe in a different way. In this lesson, your student will look at periscopes, kaleidoscopes, curved mirrors, and telescopes. There are instructions for making and observing two of these different technologies. The lesson includes instructions for making and observing a simple kaleidoscope, while the Optional Follow-up Activities include instructions for a periscope and a larger kaleidoscope. Help your student construct these devices so that he or she can see and have fun with reflecting technologies.

Learning Outcomes

It is expected that your student will be able to

- describe the examples of a periscope and telescope, both of which extend our senses and enhance our ability to gather data and information about the world;
- describe reflecting technologies that did not exist in the past;
- follow a given set of procedures to make a simple kaleidoscope;
- make observations regarding the number of images seen when a given number of mirrors are set at different angles;

- identify the link between the angle of the mirrors, the number of mirrors, and the number of images seen;
- compare how light interacts with a variety of optical devices, including a periscope, kaleidoscope, curved mirror, and telescope;
- recognize that light can be reflected and that shiny surfaces are good reflectors.

Additional Required Materials

Activity 11: Making a Kaleidoscope

- 3 small, flat, unframed mirrors (8 cm × 10 cm or so)
- tape (Duct tape works best.)
- a crayon or a marble
- a ruler

Lesson 12: Bending Light

Summary

In this lesson, your student will observe how light is bent by transparent objects or substances. Your student will investigate two factors that affect how much light is bent—the type of material and the shape of the object. The activity included with this lesson is most easily done with a helper, because your student shouldn't move except for those times mentioned in the procedure. In this lesson, your student will take A Closer Look at fibre optics, a technology that bends light by reflecting it.

Learning Outcomes

It is expected that your student will be able to

- describe how the knowledge of reflecting light has led to the development of the technology of fibre optics;
- describe fibre optics as a technology that did not exist in the past;
- follow a given set of procedures to investigate which substances bend light the most;
- draw a conclusion regarding which substance bends light the most, based on observations and measurements;
- demonstrate how different substances and shapes of objects can be used to change the direction of light;
- recognize that light can be bent (refracted).

Additional Required Materials

Activity 12: Changing the Direction of Light

- a clear drinking glass
- a penny
- water
- about 50 mL vinegar
- about 50 mL cooking oil
- a helper
- a measuring tape or metre-stick

Lesson 13: Lenses

Summary

In this lesson, your student will study concave and convex lenses. He or she will also look at some of the applications of these two lens shapes. A Great Scientist features Anton van Leeuwenhoek, the inventor of the microscope. Microscopes are an important scientific tool. If possible, provide an opportunity for your student to view objects through a microscope. Your student could see how the two lenses work together to magnify objects. If your student wears glasses, he or she will find the A Closer Look feature, Nearsightedness, particularly interesting. This feature explains what being nearsighted involves and how eyeglasses correct a person's vision.

Learning Outcomes

It is expected that your student will be able to

- describe the examples of eyeglasses and microscopes that extend our senses and enhance our ability to gather information about our world;
- give the examples of eyeglasses and microscopes as new applications for scientific ideas about lenses;
- describe eyeglasses as an example of a tool that can respond to a nearsighted person's need to see;
- describe a microscope as a tool that can help scientists research living things;
- identify opticians as people in the community who make lenses for eyeglasses;
- construct a lens to view an image;
- make observations about how a lens can change the direction of light;
- compare how light interacts with concave and convex lenses;
- demonstrate the ability to use a lens and be able to describe how lenses can be used.

Additional Required Materials

Activity 13: Lens Maker

- a clear, round, straight-sided drinking glass
- water
- a piece of cardboard (about 6 cm × 6 cm)
- a thick marker (felt pen)
- a ruler
- an object you can use to prop the cardboard

Lesson 14: White Light

Summary

In this lesson, your student breaks up white light into a spectrum. The most well-known spectrum is a rainbow. On a warm, sunny day, you can make a small rainbow for your student. Run a sprinkler so that it is misting the water over an area. Have your student walk around the sprinkler. When can he or she see the rainbow? Your student should be able to see the rainbow only when the Sun is behind him or her and the misting water is in front. Your student will also discover that the primary colours of light are red, blue, and green. It would be useful to compare these colours to the primary colours of pigments, which are red, yellow, and blue. Pigments, such as paint, are different from colours of light because red, yellow, and blue will create a black colour, and white is the absence of pigment. Light, on the other hand, shows that red, blue, and green make white light, while black is the absence of light. The next two lessons will explain this.

The Internet page mentioned in this lesson is an excellent website. By accessing the site map, your student can choose to perform a number of activities involving colour and light. One of these activities has your student perform an activity with his or her computer monitor.

Learning Outcomes

It is expected that your student will be able to

- follow a given set of procedures to make a spectrum with bubble solution;
- demonstrate that white light can be separated into colours.

Additional Required Materials

Activity 14: Bubble Rainbows

- 40 mL liquid dish detergent (Dawn™ works best.)
- 5 mL glycerine (optional; available at pharmacies, toiletries departments)
- 1 L water
- a metal coat hanger
- yarn (optional)
- a tray large enough to hold your bubblemaker
- measuring spoons
- a measuring cup
- a spoon for mixing

Lesson 15: Making Colours

Summary

In this lesson, your student compares the mixing of paint colours (pigments) and the mixing of light colours. Your student is asked to predict the results of both and then to find out what colours are actually made when the same colours of paint and light are mixed. He or she will find that the three primary colours of light mix to make white light. In addition, your student will discover that

- green + red = yellow
- green + blue = cyan (blue-green)
- blue + red = magenta (a deep purplish red)

Your student will make coloured flashlights during this activity. Keep these flashlights for the Optional Follow-up Activities.

Learning Outcomes

It is expected that your student will be able to

- follow a procedure to mix colours of pigments and colours of light;
- make observations that are relevant to the activity;
- construct coloured light sources;
- identify the differences between the results for mixing pigments and mixing light colours;
- draw a conclusion regarding the colours created when mixing the primary colours of light.

Additional Required Materials

Activity 15: Colour Mixing

- red, green, yellow, and blue paint (tempera paints, water colours, finger paints, or vegetable food colouring)
- red, green, yellow, and blue cellophane (Coloured tissue paper brushed with cooking oil and allowed to dry will also work.)
- 4 flashlights
- scissors
- 2 sheets of white paper
- tape
- a room that can be darkened
- a paintbrush or eyedropper

ASSIGNMENT BOOKLET 3B

Science 4
Module 3: Section 3 Assignment

Home Instructor's Comments and Questions

_____
Home Instructor's Signature

FOR SCHOOL USE ONLY

Assigned Teacher:

_____

Date Assignment Received:

_____

Grading:

_____

Additional Information:

_____
_____
_____
_____
_____
_____
_____
_____

FOR HOME INSTRUCTOR USE
(if label is missing or incorrect)

Student File Number:

_____

Date Submitted:

_____

Apply Module Label Here

Name
Address
Postal Code

Please verify that preprinted label is for correct course and module.

Teacher's Comments

_____
Teacher's Signature

Home Instructor: Keep this sheet when it is returned to you as a record of the student's progress.

INSTRUCTIONS FOR SUBMITTING THIS DISTANCE LEARNING ASSIGNMENT BOOKLET

When you are registered for distance learning courses, you are expected to regularly submit completed assignments for correction. Try to submit each Assignment Booklet as soon as you complete it. Do not submit more than one Assignment Booklet in one subject at the same time. Before submitting your Assignment Booklet, please check the following:

- Are all the assignments completed? If not, explain why.
- Has your work been reread to ensure accuracy in spelling and details?
- Is the booklet cover filled out and the correct module label attached?

MAILING

1. Do **not** enclose letters with your Assignment Booklets. **Send all letters in a separate envelope.**

2. Put your Assignment Booklet in an envelope and take it to the post office and have it weighed. Attach **sufficient postage** and seal the envelope.

FAXING

1. Assignment Booklets may be faxed to the school with which you are registered. Contact your teacher for the appropriate fax number.

2. All faxing costs are the responsibility of the sender.

E-MAILING

It may be possible to e-mail your completed Assignment Booklet to the school with which you are registered. You also may be **required** to e-mail some of your assignments. Contact your teacher for the appropriate e-mail address.

Science 4

Light and Shadows
Assignment Booklet 3B

3

Alberta
EDUCATION

Learning
Technologies
Branch

FOR TEACHER'S USE ONLY

Summary

	Total Possible Marks	Your Mark
Lesson 9 Assignment	10	
Lesson 10 Assignment	11	
Lesson 11 Assignment	18	
Lesson 12 Assignment	9	
Lesson 13 Assignment	8	
Lesson 14 Assignment	11	
Lesson 15 Assignment	15	
	82	

Teacher's Comments

Science 4
Module 3: Light and Shadows
Assignment Booklet 3B
Learning Technologies Branch

Cover Art: Art Parts/Ron and Joe, Inc (www.ronandjoe.com). Used by permission.

The Learning Technologies Branch acknowledges with appreciation the Alberta Distance Learning Centre and Pembina Hills Regional Division No. 7 for their review of this Assignment Booklet.

This document is intended for	
Students	✓
Teachers	✓
Administrators	
Home Instructors	✓
General Public	
Other	

You may find the following Internet sites useful:

- Alberta Education, **http://www.education.gov.ab.ca**
- Learning Technologies Branch, **http://www.education.gov.ab.ca/ltb**
- Learning Resources Centre, **http://www.lrc.education.gov.ab.ca**

Exploring the electronic information superhighway can be educational and entertaining. However, be aware that these computer networks are not censored. Students may unintentionally or purposely find articles on the Internet that may be offensive or inappropriate. As well, the sources of information are not always cited and the content may not be accurate. Therefore, students may wish to confirm facts with a second source.

Copyright © 2006, Alberta Education. This resource is owned by the Crown in Right of Alberta, as represented by the Minister of Education, Alberta Education, 10155 – 102 Street, Edmonton, Alberta, Canada T5J 4L5. All rights reserved.

This courseware was developed by or for Alberta Education. Third-party content has been identified by a © symbol and/or a credit to the source and must be used as is. This courseware may be reproduced in any form, including photocopying, without the written permission of Alberta Education. Changes can be made only to content owned by Alberta Education. For more detailed information, refer to the Terms of Use Agreement. Every effort has been made to acknowledge the original source and to comply with Canadian copyright law. If cases are identified where this effort has been unsuccessful, please notify Alberta Education so corrective action can be taken.

THIS COURSEWARE IS NOT SUBJECT TO THE TERMS OF A LICENCE FROM A COLLECTIVE OR LICENSING BODY, SUCH AS ACCESS COPYRIGHT.

ASSIGNMENT BOOKLET 3B
SCIENCE 4: MODULE 3
SECTION 3 ASSIGNMENT

This Assignment Booklet is worth 82 marks out of the total 179 marks for the assignments in Module 3. The value of each assignment and each question is stated in the left margin.

Read all parts of your assignment carefully and record your answers in the appropriate places. If you have difficulty with an assignment, go back to your Student Module Booklet and review the appropriate lesson. Be sure to proofread your answers carefully before submitting your Assignment Booklet.

Note: If you are using electronic assignments, you will need to do the following:

- You need to print the pages that ask you to make a drawing. You will find them in your PDF file.
- You will need to mail your drawings to your teacher.

82

Section 3 Assignment: Twisting, Bouncing, and Breaking Up

3

9. a. What happens when light rays meet a transparent object? Describe an example of this using a real transparent object.

_____

_____

_____

2

b. What does **refraction** mean?

_____

_____

_____

(3) c. What happens when light rays meet an opaque object? Describe an example of this using a real opaque object.

_____

_____

_____

(2) d. What does **reflection** mean?

_____

_____

_____

Your teacher is looking for

- answers in complete sentences (1 mark each)
- answers that show your understanding of reflection and refraction (1 mark each in 9.a. and 9.c. for an example; 1 mark each for the explanation in 9.b. and 9.d.)

When you are ready, turn to Lesson 10 in your Student Module Booklet.

(3) 10. a. Why would a good image reflector need a smooth surface? Give an example of a good image reflector.

_____

_____

_____

Your teacher is looking for

- a correct example (1 mark)
- a good explanation (1 mark)
- an answer in complete sentences (1 mark)

(2) b. Fill in the blanks of the statement below.

A good reflector has to _____ more light than it _____.

Your teacher is looking for

- words that complete the sentence correctly (1 mark each)

(6) c. Which of the following objects is a good reflector? Write a "Y" beside each object that is a good reflector and an "N" beside each object that is not.

_____ mirror
_____ metal cooking pot
_____ soil
_____ cardboard box
_____ wooden cupboard door
_____ compact disc (shiny side)

Your teacher is looking for

- correct sorting of good and bad reflectors (1 mark each)

When you are ready, turn to Lesson 11 in your Student Module Booklet.

(3) 11. a. What does a periscope help you do? Explain.

_____

_____

_____

(3) b. What happens to the size of the image when periscope mirrors are set far apart?

_____

_____

_____

(3) c. What does a kaleidoscope help you do?

(3) d. What happens to the number of images when there are more mirrors in a kaleidoscope?

(3) e. What does a telescope help you do?

(3) f. Why are telescopes being built with bigger mirrors?

Your teacher is looking for

- answers written in complete sentences (1 mark each)
- answers that show how well you understand reflecting technologies (2 marks each)

When you are ready, turn to Lesson 12 in your Student Module Booklet.

(4) 12. a. Why does light bend when it travels from air into water?

_____

_____

_____

Your teacher is looking for

- a clear, complete explanation (3 marks)
- an answer in complete sentences (1 mark)

(5) b. Do all transparent objects or substances bend light the same amount? How do you know? (Use examples from Lesson 12 to help you answer this.)

_____

_____

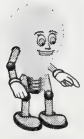
_____

_____

_____

Your teacher is looking for

- an answer that gives a clear, complete explanation (3 marks)
- an example (1 mark)
- an answer in complete sentences (1 mark)



When you are ready, turn to Lesson 13 in your Student Module Booklet.

(2) 13. a. There are two lenses shown below. Label one of them as a convex lens and one of them as a concave lens.

_____

_____

Your teacher is looking for

- correctly labelled diagrams (1 mark each)

(2) b. Name two places where convex lenses are used.

- _____
- _____

Your teacher is looking for

- correct examples (1 mark each)

(4) c. Think back to when you looked at the arrow through your convex lens. What happened to how you saw the arrow when you pulled the lens away from the arrow?

_____

_____

_____

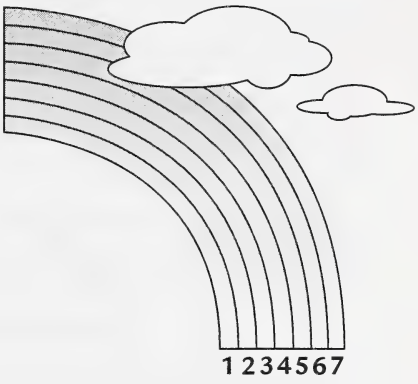
Your teacher is looking for

- a clear, complete explanation (3 marks)
- an answer written in complete sentences (1 mark)

When you are ready, turn to Lesson 14 in your Student Module Booklet.

(7) 14. a. Label the colours of light in a rainbow.

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____



Your teacher is looking for

- a neatly written list that shows the seven colours of the rainbow in the correct order (1 mark each)

(4) b. What are the three primary colours of light?

_____

_____

_____

Your teacher is looking for

- an answer in complete sentences (1 mark)
- the names of the primary colours of light (3 marks)

When you are ready, turn to Lesson 15 in your Student Module Booklet.

(15) 15. How are mixing paint and mixing light different?

Your teacher is looking for

- your answer written in complete sentences (3 marks)
- comparisons of the colours of paint and light created when different coloured paints are combined and when those same colours of light are combined (12 marks)

Now return to your Student Module Booklet to read the Section 3 and Module conclusions and the Optional Follow-up Activities.

Home Instructor Feedback Form

Module 3: Section 3

Answer the following questions and mail them in with the completed assignment for this section.

1. Did your student have trouble understanding the new terminology in this section? If so, which words caused the most problems?

   _____

   _____

2. Were the timelines for the lessons in this section adequate?

   a. Which lessons, if any, took much longer than the suggested 45- to 60-minute allotment?

      _____

      _____

   b. Which lessons, if any, took much less time than the suggested 1-hour allotment?

      _____

      _____

3. How well was your student able to understand how light bends and reflects? What difficulties, if any, did your student experience?

   _____

   _____

4. Did your student experience any difficulties understanding the differences between mixing paints and mixing light colours? If so, please explain.

   _____

   _____

Please add any questions or comments you may have.

Student Feedback Form

Module 3: Section 3

Answer the following questions and mail them in with the completed assignment for this part. This is not a test and there are no marks assigned.

1. What are the two most important things that you discovered about light in this section?

_____

_____

_____

2. In this section, you have found out many facts about light and the way it travels. What are two new questions that you have about light?

- _____

_____

- _____

_____

3. When you predicted the colours that would be made by mixing coloured light, what combinations surprised you the most?

_____

_____

_____

4. What did you find most difficult to understand about how you see colour?

_____

_____

_____

Checklist for Module 3: Assignment Booklet 3B

Make sure you send in all of the following items:

- ❑ Assignment Record Form
- ❑ Assignment Booklet 3B, questions 9–15
- ❑ Home Instructor Feedback Form
- ❑ Student Feedback Form
- ❑ Optional Follow-up Activity (optional)

Are you sending some work by e-mail and other work through the mail? If so, send a note to your teacher. That way your marks will not be given until all work has been received.

© 2006